births over deaths in 1880-90 would have been from 25 to 30 per cent. more than in the previous decade, or at least 9,500,000, whereas it appears to be under 7,000,000. The figures of the 1890 census are, therefore, quite incredible.

The superintendent of the 1890 census has issued an explanation, which does not, we fear, amount to very much. He makes a great deal of the errors in the 1870 census, which we have already glanced at, and asserts that the rate of growth of population, when proper corrections are made, was much less than 30 per cent. in the 1870-80 period, so that the rate of 24½ per cent. between 1880 and 1890 does not show a great falling off. But while he makes too much of the 1870 errors in amount, he makes no mention at all of the much larger immigration between 1880 and 1890 than in the previous decade, which should have made a difference of at least 3½ per cent. in the rate of growth in favour of the latter as compared with the former period.

A farther explanation is that there is a permanent tendency for the rate of growth of the population of a country like the United States to fall off. But this is not confirmed so far by any figures of a completely trustworthy kind, while the falling off in the rate of growth to be here accounted for is too great and sudden to be explained in such a manner.

The blunder is thus left quite unexplained, and the people of the United States, we may hope, will not fail to see to it. It concerns wider than merely national interests that the blunder should be seen to. For purposes of comparison, every census in the world is thrown out. Looking at the causes of the errors in the 1870 census, viz. an attempt to understate the numbers of the people in Democratic States, and at the special complaints of under-statement which have now come from New York and other Democratic centres, we have altogether too much reason to fear that the cause of the blundering is political. But, whatever the cause may be, it should be stringently looked into.

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## SPIDERS' WEBS.

*American Spiders and their Spinning Work: a Natural History of the Orb-weaving Spiders of the United States, with Special Regard to their Industry and Habits.* By Henry C. McCook, D.D. Vol. II. pp. 1-479, with 5 Coloured Plates and 401 Woodcut Figures. (Philadelphia: Allen Lane and Scott, 1890.)

IN a notice of vol. i. of the above work (NATURE, vol. xlii. p. 244), its object and scope were explained. Vol. ii., now before us, fully justifies what was there stated as to the thoroughness with which the available materials on the subject have been brought together from all sources, and for the first time presented to the world as a whole. A similar popular treatment also of this interesting and most important part of the subject is again here observable. Vol. i. was occupied with the snares and web-spinning of orb-weaving and some other spiders, principally in relation to the getting of their livelihood. Vol. ii. treats of these spiders in respect to the propagation of their kind, and web-spinning as subservient to this. Vol. i., in fact, presents us with spiders safely arrived at maturity, and forming their snares and webs with all the diversity and perfection peculiar to each species; while vol. ii. takes them up at that point, and shows them to us in all the different peculiarities pertaining to the performance of the ultimate object of their existence. Naturally, therefore, the volume before us begins (part i., chapter i.), with an account of the sexes in their relation to each other preparatory to actual pairing. This latter and the points arising out of it form the staple of chapters ii. and iii., which complete part i. A certain air of sentimental allusion, which appears to pervade the author's method of presenting this part of his subject, is perhaps merely a matter of taste, and so beyond the province of scientific criticism. It may be, however, that this, while it certainly adds nothing to scientific accuracy or progress, does add to the popularity of the subject, which is evidently throughout the work one of its author's great objects. On the small size of many male spiders compared with their bulky females, Dr. McCook does not appear to accept the views of a former writer upon it, in which it should be observed that the primitive equality in the size of the sexes is by no means implied; the general rule being that the male is the smaller of the two. But if it be granted that the female had a propensity for attacking and devouring the male, those males which happened to be the smallest and most active would be the most likely to escape, and perform the functions of the sex; natural selection would then come in, and operate gradually in the direction of lessening the size of the males. That there are numerous spiders, and groups of spiders, in which the sexes are nearly equal in size, or live in amity together, or in which the males are furnished with some protective armature against the ferocity of the female, proves nothing against the theory of the action of natural selection in lessening the size of the male in such cases as those where a devouring propensity existed and was otherwise unprovided against; for in groups where any approach to equality in size existed and became protective, or where some other protection became developed, there would be no need, in fact no case, for natural selection in the direction of diminished size, there being no advantage to be gained under it. The drift, however, of the author's reasoning on this subject (p. 7) is not very apparent.

Part ii. treats of the "Maternal Industry and Instincts of Spiders"; embracing the formation of cocoons for the reception of their eggs, and the bringing into existence of the young, which naturally leads (part iii.) to the consideration of the life of the young while still engaged in the struggle for existence necessary for the survival of the fittest. The dispersion of spiders on the approach of maturity leads to an account of their method of locomotion on gossamer lines and flakes, completing part iii.

Part iv. enters into the subject of the senses of spiders, and their relation to habit. The structure of the eyes, and their functions are gone into in considerable detail. The remarkable position of these organs in the males of some species—such as *Walckenaera acuminata*, Blackw., in which they are seated near or at the top of a very long slender kind of footstalk—is mentioned; and it is supposed (p. 298) that this might give the male spider an advantage when in search of the female; but, apart from this explanation not being warranted by any known facts as to the

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habits of the spider, it would seem to be well enough accounted for as the result of excess of vigour or vital force belonging to the stronger or male sex. The action of natural selection would operate here also, indirectly, and these and other similarly excessive developments would only be checked when they tended to become, or became (as in some cases they indeed appear to have nearly become), positively detrimental, or at any rate disadvantageous, to the sex. The senses of spiders—"smell," "hearing," and "touch"—are then gone into. In connection with the sense of "hearing," various stock stories about spiders and the effect of musical sounds upon them are detailed; but such small credit is attached to them as relating facts on which any scientific conclusions can be based, that it would hardly seem to have been worth while to swell an already bulky volume by their repetition. Chapter x. of part iv. ends with the details of the stridulating power of some spiders and its probable purpose. Chapter xi., on the colour, and colour-sense, brings part iv. to a conclusion. The more brilliant colouring and ornamentation of the male spider, in some groups, is accounted for by the preference supposed to be given on the part of the female to males thus ornamented. But it does not appear that this preference is yet proved in any instance as a fact; nor can it be fairly argued that, because sexual excitement often leads the male to display it in curious antics and contortions, it therefore follows that the female is in the least influenced by it; whereas in fact, as she is stated to be (p. 63), the female is generally an unmoved spectator. Doubtless the male frequently succeeds in his purpose after such displays—*post hoc* certainly, *sed non propter hoc.* The author having come to the conclusion that the female prefers the male for his bright colours, we are not surprised to find it argued, conversely, that in those groups where it is the female sex which is the largest and bears the brightest hues, it is the less gaudy male who is helped and influenced in his choice by the increased size and excessive coloration of the female. The argument here also does not appear to have more real weight than in the former case, if even so much. On the subject of adaptation of the colouring of spiders to their surroundings and its beneficial effect, the opinion is expressed that, considering the great exposure to enemies of numbers of brilliantly coloured and conspicuous spiders, no generalization is yet warranted. No weight seems here to be given to the supposition that some of these exposed spiders may be distasteful as food; while it is admitted that many, as those of the genera *Gasteracantha* and *Acrosoma*, are protected by their spiny armature, and, it may be added, by their generally hard integument. The theory of "warning colours" is dismissed as inapplicable to spiders. Adopting the experiments of Sir John Lubbock and Mr. and Mrs. Peckham, spiders are considered to possess a sense of colour; but when we are told that a test case was afforded by a spider whose eyes had been purposely blinded with paraffin, our confidence in the result of these experiments will perhaps be a little shaken; since it is gravely argued from this test case that, because a blind spider exercised no apparent choice of one colour over another, this proves that the apparent preference of a spider before blinding was a true choice, and that there exists a colour-sense in certain spiders. Chapter xii. of part v. is on that most interesting part of natural history in all its departments—resemblance to other objects both inanimate and animate, with the causes and consequences of the resemblance. Space will not permit us to follow the author in the details of this part of his subject. The chapter will be read with pleasure and interest by most observers; but we may perhaps remark that there is at times an apparent tendency to take inability to perceive any resulting advantage from the resemblance as a proof that the resemblance is not the result of natural selection.

Chapter xiii. of part v. treats of the enemies of spiders, and their influence on habit. This subject is, of course, closely connected with protective resemblance; and by no means the least interesting part of this chapter is the account of some truly parasitic spiders—*Mimetus interfector* and others. These take up their abode in the webs of other spiders, and after eating the rightful owner, regale themselves at leisure upon its eggs and young. Part v. ends with chapter xiv., on "Death and its Disguises; Hibernation, and Death feigning." Natural death may be almost said to be an unnatural event in the history of most of the creation, excepting man; but perhaps more frequent instances of it are seen by the entomologist and araneologist, than by other naturalists. Some of our British *Drassidæ*, in the genus *Clubiona* for instance, may often be found sewn up in a nest of leaves drawn together, with their egg-sac, brooding over it, in various stages of lethargy, sometimes so shrivelled and comatose as to be almost incapable of movement. These spiders probably drop to the earth with the opening of the nest for the exit of the young, and at once die when their progeny begin to live. The author gives interesting details of a similar kind in reference to spiders of the family *Epeiridæ* far removed from the *Drassidæ*, and we have also noted it in another family equally remote from both, *Thomisidæ*. "Death feigning" is considered to be perfectly voluntary, though perhaps developed out of an original state of "fright-paralysis"; contrary to the opinion and explanation given by Darwin of this habit. The concluding part of the book, part vi., contains an account of fossil spiders, a subject which, though bearing very little upon the "spinning work of spiders," has a very strong and an increasing interest of its own. It appears to be well treated in the twenty-three pages here devoted to it. We cannot leave this necessarily very incomplete notice of Dr. McCook's bulky volume without drawing especial attention to the numerous (401) woodcuts, and the coloured plates, with which it is so profusely and usefully illustrated. The greater part of these are engraved from the author's own original drawings, and evidence a skill as well as a power of patient observation scarcely equalled in any contemporary work on natural history.

O. P. C.

## *MR. BASSET'S ELEMENTARY TREATISE ON HYDRODYNAMICS AND SOUND.*

*An Elementary Treatise on Hydrodynamics and Sound.* By A. B. Basset. (Cambridge: Deighton, Bell, and Co. London: George Bell and Sons. 1890.)

WHEN the Senate of the University of Cambridge decided to adopt the suggestion of the Special Board for Mathematics to include the elements of hydro-

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